

stepone tech



Installation and user's manual

PIN:

eFlexFuel Commander application available in



Table of contents

1. Foreword	3
2. Introduction to eFlexFuel E85 conversion kit	4
3. Installation of the conversion kit	6
4. Auto- and safe mode	10
5. Ethanol fuel and operating in cold climates	11
6. Terms of use	12

eFlexFuel is designed and assembled in Finland

Contact information:

StepOne Tech Ltd., Tampere.
email: eflexfuel.info@gmail.com
www.eflexfuel.com

1. Foreword

Thank you for choosing eFlexFuel E85 conversion kit, a product designed in Finland to endure vastly different climatic conditions encountered in the Northern Europe. With this conversion kit, you can easily upgrade your gasoline powered car to become a true flexfuel car. After the installation, you can use ethanol based E85 fuel blend, regular gasoline, or any mixture of the two. This conversion kit is compatible with almost any car equipped with a fuel injection.

Please read this instruction manual in its entirety before attempting to install or to use the conversion kit. In addition to describing the installation and usage of the conversion kit, this manual will let you know the different aspects associated with using E85 fuel blend.

The advantages of ethanol based fuel

E85 offers many advantages over regular gasoline. First of all, cost of driving will be notably cheaper. At the same time, you save the environment! The CO₂ emissions of bioethanol are significantly lower than those of the regular gasoline.

How much have you saved?

The home page of eFlexFuel E85 conversion kit contains a calculator which you can use to estimate savings incurred by driving an E85-powered car. To use the calculator, you need to input the average fuel consumption, distance driven, and the prices of the fuels.

Please make note of the following items before installing the eFlexFuel E85 conversion kit!

- ✓ You have accepted the terms of use of eFlexFuel conversion kit (section 6).
- ✓ The conversion kit is only compatible with gasoline powered cars.
- ✓ The conversion kit is only compatible with high impedance fuel injectors.
- ✓ The conversion kit is not compatible with direct injection engines (FSI, TSI, GDI, etc.).
- ✓ Verify adequate flow rate of the fuel injectors (E85 requires c. 30% higher flow rate).
- ✓ Car needs to be in normal operating condition.
- ✓ The car's oxygen sensors needs to operate normally (passed smog inspection).
- ✓ The maximum operating temperature of the conversion kit is +90°C (190 °F).
- ✓ The conversion kit is only compatible with 12V electrical systems.

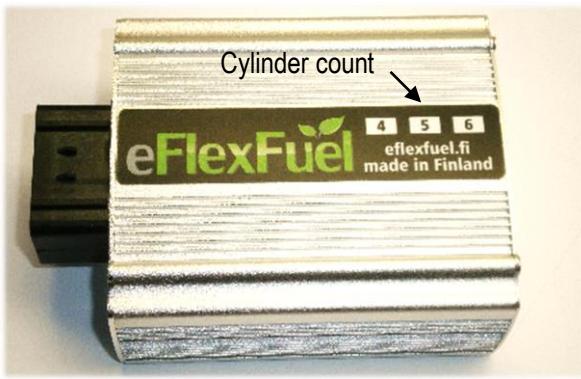
2. Introduction to eFlexFuel E85 conversion kit

eFlexFuel E85 conversion kit comprises three main parts: a control unit, an ethanol sensor and a wiring harnesses.

V-Models are designed for 8 to 12 cylinder engines. V-model includes two control units and eFlexLink cable to connect the two separate units.

eFlexFuel control unit

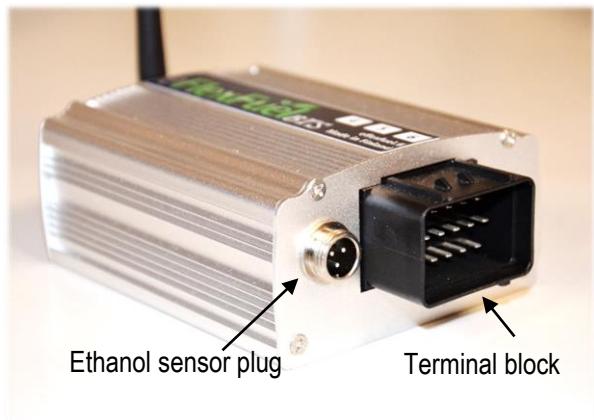
The control unit of eFlexFuel E85 conversion kit contains all the electrical components required to control the conversion kit. The numbers (4-6 or 8-12) on the top the unit indicate how many injectors can be controlled with the unit (the corresponding number is encircled).



One end of the control unit has an indicator light and an antenna for wireless connection.



The other end of the controller has a male connector that is used to connect the wiring harness. There is also a 3-pole connector for an ethanol sensor.



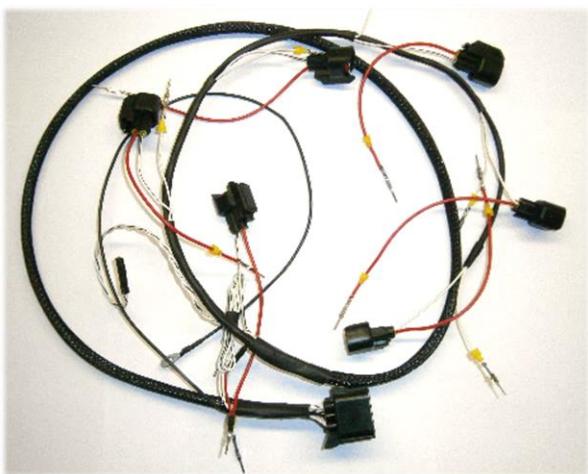
PLEASE NOTE!

Both controllers in V8-V12 models have the antenna so you can monitor operations of the device .

eFlexFuel wiring harness

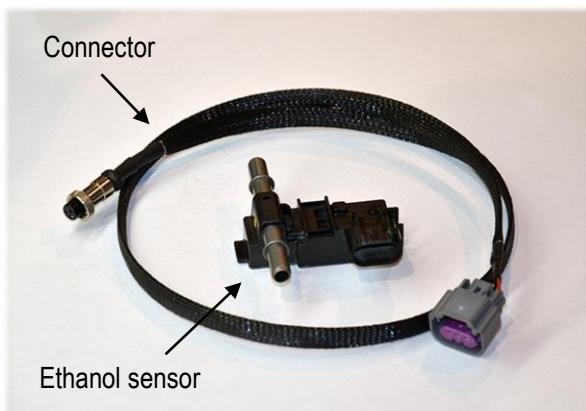
The wiring harness is used to connect the control unit to the car's fuel injectors. The wiring harness is specific for each car model. The number of fuel injector connectors and their type depends on the car where the harness is being installed. Wiring harnesses are also sold separately, for example, if the control used is transferred to another car.

The wiring harness has a strip connector for the controller unit, ground wire with a round connector, a thermal sensor and injector connectors. Wiring harness for V8-V12 models also includes connectivity cable for connecting master and slave devices together.



Ethanol sensor and connector cable

eFlexFuel are equipped with the ethanol sensor and a connector cable to receive data from the ethanol sensor.



3. Installation of the conversion kit



The installation of the eFlexFuel E85 conversion kit is easy and does not require any structural modifications to the car's original electrical or fuel injection systems. It is connected in parallel with the car's injector wires with the included wiring harness. The installation requires only altering several connections, connecting the wiring harness and installing the ethanol sensor.

Please follow these instructions in detail and according to the numbered steps in order to ensure that the conversion kit operates as planned.

Time and tools required for the installation

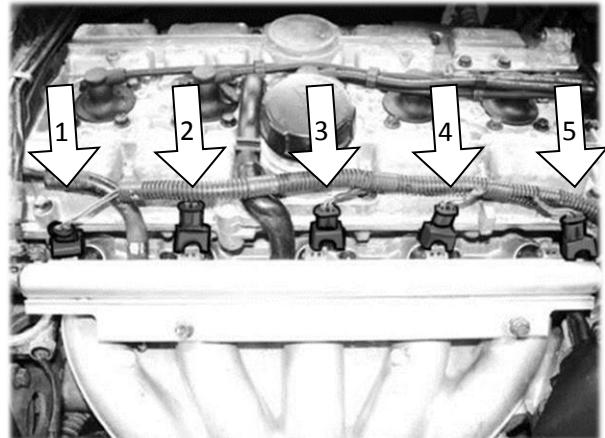
It is recommended to have basic tools and a multimeter when installing eFlexFuel.

PLEASE NOTE!

Prior to installing the eFlexFuel E85 conversion kit, the car's ignition switch needs to be set to off position. This is easily ensured by removing the keys entirely from the ignition switch.

1) Locate the fuel injectors

Start the installation by locating the fuel injectors on the car's engine. They are usually located on top of the intake manifold close to the engine block and their number is typically equal to the number of the engine's cylinders. The picture below shows the location of fuel injectors on a 5-cylinder Volvo engine:



PLEASE NOTE!

You may need to remove plastic covers and other components on certain cars in order to expose the fuel injectors.

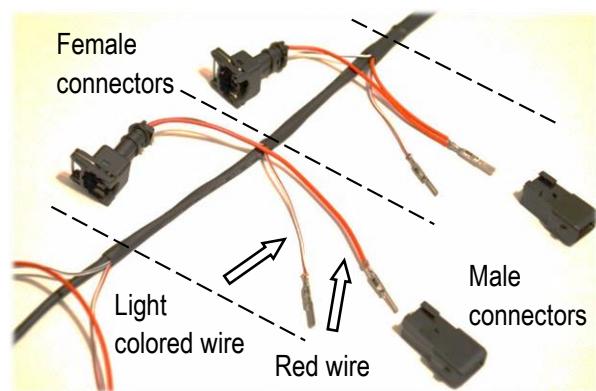
In some engines, the installation may require the removal of the intake manifold in order to expose the fuel injectors.

2) Disconnect the fuel injectors

Once you have located the fuel injectors, disconnect them. Most connector types have a locking mechanism that prevents them from being accidentally released. You need to unlock this mechanism before disconnecting the connectors.

PLEASE NOTE!

Do not mix the order of the connectors!



3) Verify the right connector type

Make sure that the connectors of the injector wires you have disconnected match the connectors of the eFlexFuel conversion kit's wiring harness. If this is not the case, the wiring harness needs to be exchanged with a matching type. The available connector types are shown on the eFlexFuel conversion kit's web page.

4) Check the polarity of the injector connectors

eFlexFuel control unit gets its supply voltage (+12V) and injection signal through the injector wires. The injector connectors have two pins, whose polarity depends on the car's make. For this reason, the polarity of the connectors needs to be verified. To check the polarity, you'll need a multimeter.

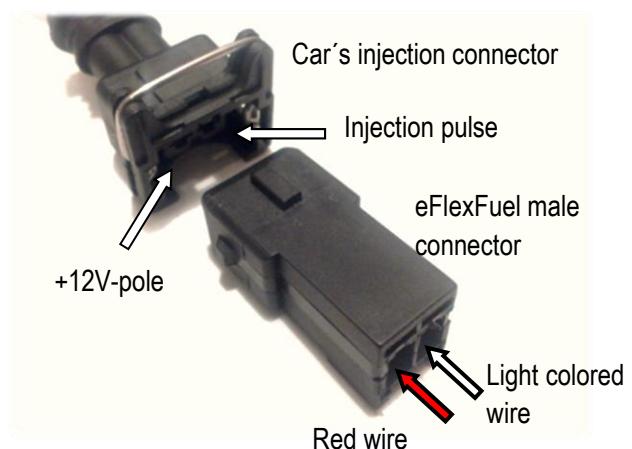
You can ensure the +12V wire by using multimeter's positive measurement. Sometimes +12V wires are of the same color. Injection signal goes through connectors to all poles. In these cables the coloring is usually different in every connector. They are not connected to each other.

5) Connect the male connectors of the wiring harness

The male connectors of the eFlexFuel wiring harness are detached upon delivery and need to be connected during the installation process. The reason for this is that the connectors are model specific. Each female connector of the wiring harness is accompanied by one male connector. The wiring harness has male-female connector pairs as shown in the following picture.

First, check in which way the male connectors fit the connectors of the car. This will let you know how to connect the rest of the wires.

Push the wiring harness' red wires to the male connectors in such a way that they are connected to the car's positive supply voltage (+12V). Then connect the light colored wires of the wiring harness to the remaining pins of the male connectors (injector signal). An example of the connection process is shown in the following picture.



Once the wire connectors are pushed in the plastic male connector housing, they will lock to the correct position. The wire connectors will lock only if positioned correctly. Be careful not to break the locking mechanisms! Some male connector types include rubber gaskets. Insert them to the connectors before pushing the wires in.

6) Connect the wiring harness to the injectors.

Once the male connectors are connected to the wiring harness, it is ready to be installed to the car. Do not mix the order of the connectors!

PLEASE NOTE!

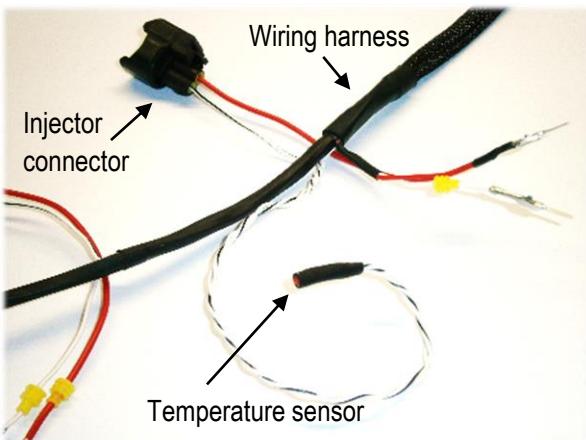
In V-models it is recommended that wiring harness is installed in different cylinder banks.

1. Connect the male connectors of the eFlexFuel wiring harness to the car's injector wires you disconnected earlier.

2. Connect the female connectors of the eFlexFuel wiring harness to the injectors on the car

7) Install the temperature sensor

eFlexFuel wiring harness has a temperature sensor around the injector connectors. This allows you to install it easily to a location where it can measure the engine temperature. A good spot for the sensor is next to the injectors close to the engine's cylinder head or on top of the valve cover. The temperature sensor must not be located close to the car's exhaust system!



8) Installing the control unit

Find a proper location for the eFlexFuel control unit in the car's engine bay. The control unit needs to be close enough to the injectors so that the wiring harness reaches the control unit and on such location that the control unit's button is easily accessible, the signal light visible, and that the unit is not exposed to excessive heat or moisture. Also, make sure that the control unit is not touching moving parts. Secure the control unit firmly with e.g. strong double-sided tape or cable ties.

9) Connect the ground wire

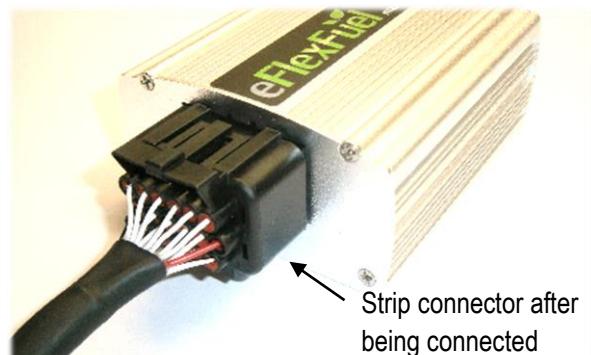
Connect the wiring harness' ground wire either directly to the negative terminal of the car's battery or to the metallic chassis of the car with the ground wire's round

connector. The ground wire is located next to the strip connector. Make sure that the ground connection is good.



10) Secure the wiring harness

Connect the wiring harness' strip connector to the eFlexFuel control unit. Make sure that the connector is securely attached and locks into the housing on the eFlexFuel control unit.



Arrange the wiring harness to the car's engine bay in such a way that none of the wires is under tension or touches moving parts. The wiring harness endures temperatures up to +120°C (250 °F), but avoid installing the harness close to the engine's hottest parts.

Secure the wiring harness with cable ties.

11) Ethanol sensor

11.1) Attention

Ethanol sensor should be installed to a location free from moving parts and high temperatures. Engine running or vehicle moving may cause rubbing to the fuel hose if installed incorrectly. Installing to hot environment may cause melting of the fuel hose which can lead to slipping or leaking of the fuel hose.

Fuel hose should be installed as straight as possible. Avoid tight bends. Minimum radius for a bend is 60mm.

Tight bending of a fuel hose may cause breaching and leaking.

It is recommended to use quick connectors in installing an ethanol sensor. If possible, using the fuel return line for installation is recommended.

If fuel hoses are added during the installation, the added fuel hose must be rated to endure high ethanol content fuels. We recommend using of SAE30R9 rated fuel hose.

Fuel hose must be rated to be used in fuel injection lines.

Don't use solvents when installing fuel hose.

The one performing the installation must ensure all mentioned risk factors are taken into account during installation.

After installation it is recommended to monitor that fuel hose isn't leaking.

11) Installation of the ethanol sensor

eFlexFuel devices are equipped with ethanol sensor which is meant to be installed in the fuel line. The low pressure fuel return line is the preferred installation place. In returnless fuel systems the sensor can also be installed in the fuel feed line. Ethanol sensor should be installed near the fuel rail. Fuel flow direction doesn't affect the result from the sensor.

The sensor has two 10 mm quick connections. Use 8-10 mm ethanol compatible fuel hose with suitable hose clamps if the car fuel line connectors are not compatible with the sensor.

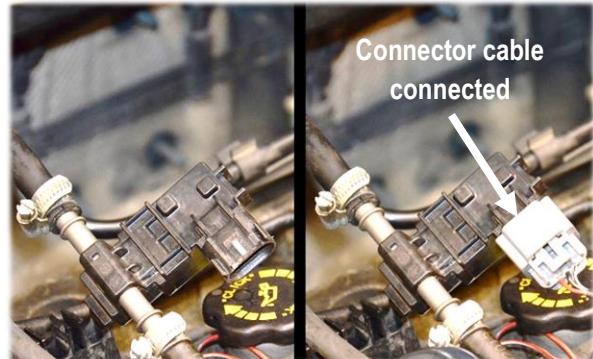
PLEASE NOTE!

Use fuel hose that meets requirements for high ethanol content fuel.

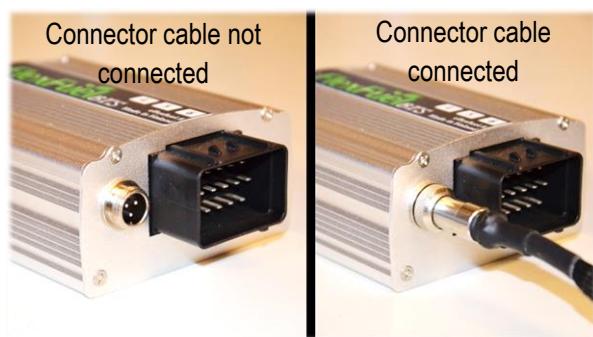
Use extreme caution if ethanol sensor is installed to fuel feed line. High pressure can loosen fuel hose if not installed properly and cause a risk of fire.



When ethanol sensor is installed to the fuel line you can connect the harness to the sensor as shown in the picture below.



Next attach another head of the sensor harness to the eFlexFuel device. Then fasten the locking ring properly as shown in the picture below.



Fasten the harness to the engine room with zip ties so it won't move. Try to avoid attaching the harness near hot surfaces in the engine room.

12) V8-V12 -models

Finish installation of eFlexFuel V8-V12 -models by attaching control units to each other with the connectivity cable included in wiring harness.

13) Finalizing the installation

Reinstall the components you have removed from the engine. Turn on the car's ignition switch. The indicator light on the control unit should now turn on. On some car models the indicator light won't turn on unless the engine is running.

If the control unit's indicator light does not turn on, check its ground wire. Bad ground connection can cause erratic behavior or total inactivity of the control unit.

Now the installation of the eFlexFuel E85 conversion kit is complete and you can start using it.

4. Auto- and safe mode



eFlexFuel devices have two operating modes: factory settings and auto-mode. Indicator light changes if the operating mode is being switched to another.

Auto-mode

Indicator light is blue if auto-mode is on. eFlexFuel is using ethanol sensor in auto-mode. You can refuel any mixture of gasoline and E85. eFlexFuel recognize fuel mixture automatically by using ethanol sensor.

Safe Mode

Safe mode goes on automatically when device is not working properly. Indicator light is red when device is in safe mode. If safe mode is on eFlexFuel is adjusted to

50% ethanol fuel mixture. It is possible to drive in safe mode but high engine load should be avoided.

Possible faults:

eFlexFuel is not connected to ethanol sensor

- Unplug and reconnect ethanol sensor to the connection cable. If this doesn't help unplug and reconnect the connector cable of eFlexFuel device. Connection to eFlexFuel is on when indicator light is blue.

Ethanol sensor recognizes dirty gasoline (e.g. water in fuel mixture)

- Refuel gasoline. Fault is reseted if indicator light turns blue.

If the problem persists problem may be with ethanol sensor. Then it must be replaced.

Thermal sensor is faulty

Malfunction of the thermal sensor does not affect normal driving or control units operations. Faulty thermal sensor affects only on cold enrichment. New wiring harness is needed if thermal sensor is faulty.

V8-V12 connectivity cable is unconnected

If connectivity cable is unconnected from "slave" device the indicator light is turned red.

5. Ethanol fuel and operating in cold climates



When E85 fuel blend is used in cold climates, the engine's cold starting gets more difficult. The reason for this is that ignition of ethanol based fuels gets harder at temperatures below +10°C (50 °F). In very cold temperature conditions, the cold starting of the engine may require multiple attempts.

eFlexFuel adjusts itself to the temperature conditions

eFlexFuel E85 conversion kit includes an external temperature sensor that regulates the control unit's automatic cold start assistant according to the engine's temperature. During the cold start assistant's operation, the control unit's indicator light is flashing maximum 60 seconds.

Improving cold starting of the car

There are different ways to improve the cold starting capability of the car. When the outside temperature is below +10°C (50 °F). The cold start capability of the engine can be improved by adding 5-10% of regular gasoline to the car's fuel mixture. During freezing temperature conditions, we recommend using engine block heater.

Add regular gasoline before you add E85 fuel blend in order to improve mixing of the fuels.

6. Terms of use

These terms of use are applicable to all eFlexFuel E85 conversion kits, their wiring harnesses, and their accessories manufactured by StepOne Tech Oy (the manufacturer). Please read these terms of use carefully before using or attempting to install the eFlexFuel conversion kit or the related components. This ensures that both parties (the buyer and the seller) are aware of how to proceed in different operational situations of the eFlexFuel conversion kit.

Guarantee and refund

The manufacturer offers a one-year manufacturer's guarantee (12 months). The guarantee applies only to the conversion kit, the included wiring harness, ethanol sensor, and their functionality. Always read the instructions on this instruction manual in its entirety before attempting to install or use the conversion kit. This ensures that the product operates to its full potential.

The guarantee does not cover damages caused by improper installation by the buyer or by the buyer's agent, or if the product has been damaged by wear that is not caused by normal use or by a manufacturing defect.

The guarantee covers faulty installation by the manufacturer or by an authorized dealer. Any modification done to the conversion kit without the consent of the manufacturer voids the guarantee.

If the product has a fault that can be regarded as a result of a faster than normal wear or a result of a manufacturing defect, the manufacturer will provide the buyer with a new product or repair the faulty product within the time that is seen appropriate by the Finnish consumer protection act. The manufacturer has the right to redeem the faulty product if it is replaced by a new one.

The manufacturer reserves the rights to any modifications, expansions, attachments, or *improvements made by customer.*

The manufacturer has to accept returns of unused products within 32 days as stipulated by the Chapter 6 of the Finnish consumer protection act.

Product liability

The use of eFlexFuel conversion kit happens at the user's own risk. Please take into account that a guarantee offered by a car manufacturer may be void once a conversion kit has been connected to the car's systems.

The manufacturer commits only to make up for damage caused to the conversion kit, the accompanied wiring harness, or accessories as covered by the guarantee.

The manufacturer does not make up for damage caused to the car by the use of ethanol containing fuel. Neither does the manufacturer make up for damage caused by the installation to the product, the installation's target or the person carrying out the installation, if the installation is carried out by the customer or by customer's agent.

The manufacturer recommends replacing the fuel hoses and gaskets with ones that meet the SAE30R9 requirements and are therefore better capable of enduring ethanol exposure.

Modified vehicle inspection

At the time of the writing, after a conversion kit has been installed and in order to meet the street legality requirements of Finland, the car needs to pass an emission measurement carried out by an authorized inspector or an inspection organization, and to pass a modified vehicle inspection. Such emission measurements are carried out by VTT Expert Services, Test World, and TÜV Nord Finland. The manufacturer is not responsible for the road legality.